AngloAmerican

# Underground Mining Safety & Technology Update

## Metallurgical Coal

February 2022

# Improving underground safety

## Extending beyond industry best practice

- Over the past 18 months, we have undertaken a complete review of the way we operate our underground Metallurgical coal mines.
- We have worked with leading industry experts and invested significantly in new equipment, underground automation technology, remote operations, gas management and data analytics, to introduce a number of advancements in the way underground coal mines operate.
- We have committed a further $5 million to fund underground mining research, in partnership with our industry research and technology partners, to improve the industry's knowledge in certain technical areas.
- We are leveraging our scale to find new ways of addressing safety risks, drawing on international best practice and technology development, to ensure our systems and processes extend beyond current industry best-practice.

*Grosvenor Mine Control Room*

# New equipment and technology

## Latest technology deployed to support safe restart

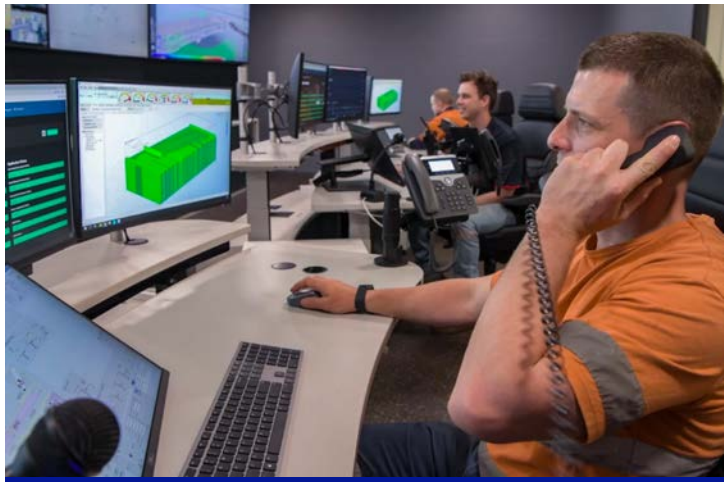
- New, **state-of-the-art longwall equipment** *(right)*
- **Latest technology and control system** to support advanced control, automation and remote operation capabilities – this system is now in place across all three underground mines to provide the scale for continuous innovation in our operations
- Following a successful testing period, **pressure sensors** have been installed to immediately cut power to the longwall face if an overpressure event occurs.
- Equipment has been assessed using our **enhanced Quality Assurance** and Quality Control processes.

***New equipment installed underground at Grosvenor Mine***

# Removing our people from higher risk areas

## Major advancements in automation and remote operations

- All **three of our underground mines are now fully remote-capable**, allowing operators to work from state-of-the-art Remote Operations Centres on the surface of the mine *(right).*
- Grosvenor and our new Aquila Mine are leveraging advancements pioneered at Moranbah North Mine, which has achieved consistent high levels of remote autonomous longwall production, following a significant ongoing program of investment and the development of industry-first applications.
- We are partnering with CSIRO to undertake a world-first trial of technology to support automation in the roadway development phase of underground coal mining.



***Moranbah North Remote Operations Centre (above) and Aquila Mine (below).***

# Enhanced gas management

**Supported by the latest in modelling, analysis and design**

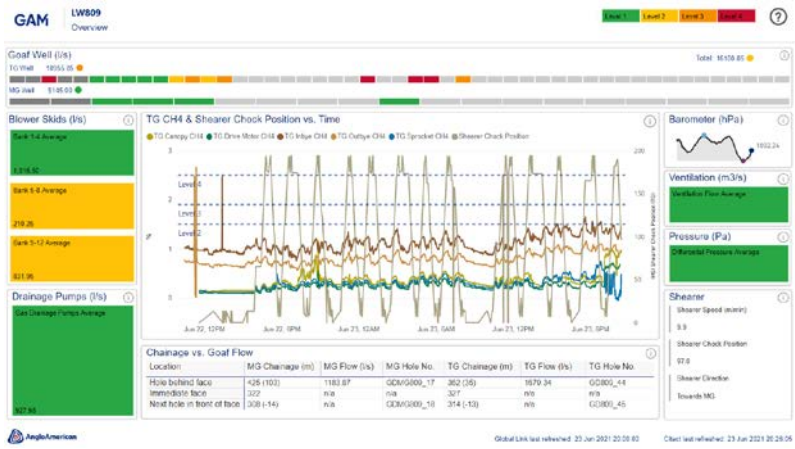
- $1.5B over five years allocated for gas management across our underground mines
- A complete review of gas and ventilation management was undertaken with external and internal experts to extend existing systems and technology beyond best practice.
- Enhanced gas management systems at Grosvenor include:
  - More than doubling gas drainage capacity
  - State-of-the-art gas modelling
  - Real-time monitoring of underground gas environment
  - Increased gas drainage activities, including targeting above and below the mining seam
  - Real-time monitoring and remote management of goaf holes
  - Increased inertisation capacity.

*New gas management infrastructure at Grosvenor Mine*

# Data science is driving operational improvements

## Enabling new monitoring, analysis and predictive capabilities

- Custom-built data capture system feeds data analysis
- Dynamic longwall gas monitoring system provides real-time monitoring and forecasting of factors affecting gas control
- System is now moving towards predictive capabilities, to support proactive intervention before an event can occur. Early analysis indicated 97.5% accuracy in one hour predictions
- Our newly-established Met Coal Analytics Centre is operationalising gas and strata management analytics to predictive capabilities, with work underway to support sites, including Grosvenor.

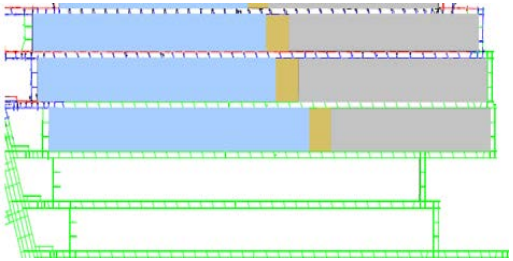


*The new Gas Analytics Monitoring (GAM) dashboard (above); Met Coal Analytics Centre (below)*

# Harnessing advancements in geotechnical data

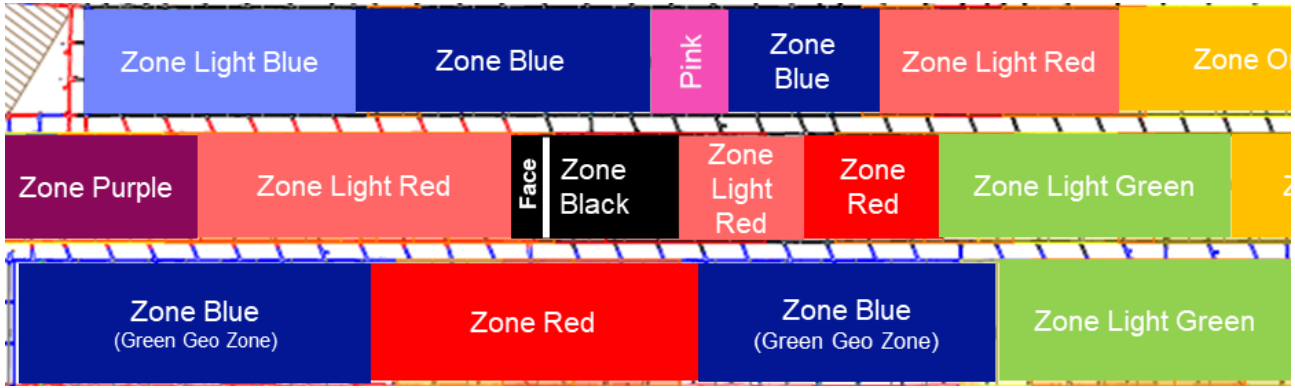
## Supporting improved safety and stability of strata conditions

- We are combining enhanced analysis capabilities with new information access - including new resource models, exploration data, mapping and modelling – to improve operational strategies, benchmarking across longwall blocks and improve our gas predictive capabilities
- Projects are underway using data science to improved strata control and strata mapping
- A new Grosvenor strata prediction (cavity model) will enhance operating strategies in challenging strata areas.



**Before**

**After**



# Reducing coal heating risk

## Enhanced practices and processes to eliminate spontaneous combustion events

- While we have extensive monitoring and proactive goaf inertisation practices in place across our underground mines, additional strategies have been developed to reduce the risk of spontaneous combustion, including management of oxygen ingress into the goal and post-drainage strategies integrated with overall goaf management.
- Key initiatives include:
  - Engaging internal and external experts to enhance our existing management plans
  - Revised Trigger Action Response Plans (TARPs), and introducing new TARPs such as for longwall slow retreat
  - Increased nitrogen inertisation capacity
  - Data management, including automation upgrades
  - Enhanced gas and ventilation monitoring systems to provide early identification of changes in the underground.

*New gas monitoring bores at Moranbah North Mine*

# Strengthening our safety systems and structures

## Evolving organisational and reporting structures

- Implementation of the **Anglo American Operating Model** is supporting improved planning and work execution
- Undertaking a **review of the employment model** at Grosvenor Mine
- Leveraging technical experience across our business with revised process and role structures
- **Revised reporting processes** to monitor system performance
- Following a review of existing bonus structures new incentive scheme structure **incentivising positive safety behaviours** has been introduced at Grosvenor.
- In November 2020, we announced that any gas exceedances 2.5% or above in our underground mines would be treated as an Anglo American High Potential Incidents (HPIs), to support alignment with Queensland statutory reporting.

# Living our Values

## Anglo American's global approach to Safety

- Safety is a core Value.
- $1 million donation to the Royal Brisbane & Women's Hospital Foundation to support improved outcomes for burns and trauma patients through clinical research, innovation and ongoing patient support.
- Dedicated **Elimination of Fatalities** program that is systematically addressing critical safety risks by drawing from international best practice and safety innovations.
- Throughout August/September 2021, we conducted 77 **safety resets across all sites,** focused on chronic unease, speaking up on safety, and our Elimination of Fatalities work.
- We continued this focus through our annual Anglo American **Global Safety Day**, to highlight a universal commitment to best practice mining safety and a dedication to eliminating fatalities from our business. In 2021, our theme was: *Safe to always be Safe,* focusing on psychological safety.

*2021 Safety Resets*

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# Thank you

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